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CONTENTS

Injury registration in a developing country. A study based on patients' records from four hospitals in Dar es Salaam, Tanzania

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Abstract

Background: A recent study conducted in some parts of Tanzania has revealed that injuries rank as the third major leading cause of death among the adult population only after tuberculosis and HIV/AIDS. Critical to any injury prevention activities is a reliable surveillance system. Such a system may for instance be based on hospital registration of injuries.

Objectives: The aim of this study was to evaluate available hospital records for the purpose of describing the epidemiology of injuries among inpatients in four hospitals in Dar es Salaam, Tanzania.

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Methods: The study utilized patients' medical records for the year 1998. The final sample included 1 098 cases from four hospitals. Data handling and analysis was performed using statistical software SPSS for windows version 10.0. Cross tabulations with Chi-square testing for independence, t-test for difference between means (independent groups) and one way analysis of variance was used.

Results: The age group 21 to 30 years formed the largest proportion of injury-related admissions. The male to female ratio was 2.3 to 1. The largest categories of injuries were road traffic injuries (43.7%), violence and assaults (23.5%), and falls (13,8%). Burns accounted for 6.5% of the cases. The following variables were routinely recorded in case notes: gender (100%), nature of injury/principal diagnosis (99.6%), body part injured (99.4%), and age (96.4%).

Conclusions: There is a need for improving the way injuries are recorded in hospitals. Hospitals' records could provide a useful tool for monitoring injury preventive activities in developing countries like Tanzania.

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Introduction

The World Health Organization (WHO) has recognized and given high priority to prevention of injuries as expressed in the "WHO global programme for accident prevention", a programme involving a number of injury collaborating centres worldwide. Data from developed countries has shown that by applying a strategy which contains several simultaneous approaches, it has been possible to reduce injuries by 25%.[1]

There is a general consensus among injury experts that injury surveillance systems make prevention efforts more effective. The health sector has been and will continue to play an essential role in injury prevention and control, not only for the care of injured patients, but also in surveillance systems.

Injuries are one of the leading causes of incalculable human suffering and a source of medical costs and loss to economy worldwide.[2-6] Unintentional injuries rank as the fifth most common cause of death responsible for 5.2% of the total mortality in the world. Unintentional injuries cause three million deaths each year occurring worldwide and over two million of these occur in developing countries.[1]

Injury data from developing nations are generally scanty. In some regions of Tanzania (Dar es Salaam, Hai and Morogoro), injuries have been ranked the third most important cause of adult mortality (age 15 to 59 years) accounting for 4 to 8% of all deaths. Injury related mortality is superseded only by HIV/AIDS and pulmonary tuberculosis.[7] One study estimated that injuries accounted for up to 30.9% of emergency department attendance in Uganda's largest hospital.[4]

In developed countries, hospitals have played an important role in injury surveillance.[2,8-15] One of the obstacles to injury prevention in developing countries is lack of valid, up-to-date and prevention oriented data. Most of the data available only reflect the nature of injury (diagnosis) and usually do not include a description of external causes.[16]

The aim of this study was to evaluate available hospital records for the purpose of describing the epidemiology of injuries among inpatients in four hospitals in Dar es Salaam, Tanzania.

Materials and Methods

Setting.

The Dar es Salaam region is located on the east coast of Tanzania. The population of Dar es Salaam has increased markedly from 1 360 865 inhabitants according to the 1988 census to more than two million according to estimates for 1995.[17]

The study involved the four largest consultant and teaching hospitals located in Dar es Salaam, Tanzania. Two of these hospitals i.e. Muhimbili Medical Center (MMC) and Muhimbili Orthopedic Institute (MOI) are Government owned; while Agakhan Hospital and Mission Mikocheni Hospital (MMH) are fully privately owned. These hospitals have a combined total of 1 600 beds. Permission to conduct this study was obtained from the Ministry of Health (Health Information and Research Unit Division of Healthy Policy and Planning) and from the Directors of the respective hospitals.

Study Sample.

The study included patients whose principal diagnosis in the medical records was injury of an acute nature, admitted during the period from 1 January 1998 to 31 December 1998 at MMC, MOI, MMH and the Agakhan hospitals. This study did not include outpatients, sexual related injuries (rape and sodomy) and suicides.

Cases (for MMH and MOI) were systematically sampled from a chronologically arranged list of injury related cases. Every fifth case was included in the study. For MMH and Agakhan hospitals, all cases were recruited, as there were very few cases (only 68 and 125 respectively). The data were recorded on a special form constructed from the following documents:

1. International Classification of Health Problems in Primary care (ICHPPC-2).
2. WHO Working Group for Injury Surveillance Methodology-proposal for Minimum Data Set for Injury Monitoring (MDIM).[18,19]

Statistical Analysis.

Data analysis and handling was done using SPSS for windows version 10.0. Only those variables, which had few or no missing data, were subjected to statistical tests. These included age, gender, number of days in hospital, and mechanism of injury. Other variables had a lot of missing observations. Therefore the proportion of missing observations has been reported. We used the t-test for independent groups on the difference in mean age between males and females. One way analysis of variance (ANOVA) was used to test differences in mean age and length of hospital stay among the four hospitals. The Chi-square test (x^2) was used to test independence in cross tables; p values below 0.05 were regarded as significant.

Results

Missing Observations.

Table I summarizes the missing variables. The following variables were frequently registered, age, the principal diagnosis (nature of injury), the body part injured and the gender of the injured.

Table I: Percentage of missing observations by hospital of admission.

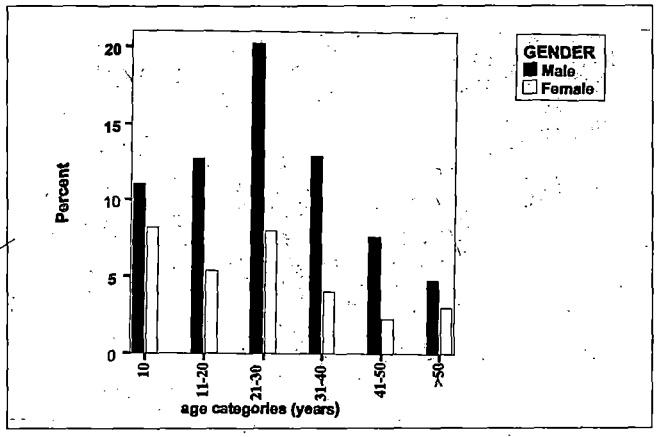
Missing Variable	MO1 (N=529) %	MMC (N=380) %	MMH (N=65) %	AGAKHAN (N=124) %	TOTAL (N=1 098) %
Education	76.8	92.6	96.9	100	86.1
Occupation	47.6	90.3	83.1	83.1	68.5
Circumstance/activity	49.8	68.2	61.5	50	56.9
Marital status	48.2	47.1	41.5	48.4	47.4
Place of occurrence	24.4	60.5	43.1	26.6	38.3
Mechanism	25.1	22.4	24.6	22.6	23.8
Intent	0.6	10	16.9	5.6	5.4
Age	3.9	2.6	9.2	2.4	3.6
Month/date of admin.	—	1.8	—	—	0.6
Body part injured	0.4	0.5	—	—	0.4
Nature of injury	0.2	0.5	—	0.8	0.4
Gender	—	—	—	—	—

Distribution of Injuries by Age and Sex.

The highest proportion of injury-related cases was found in the age group 21 to 30 years (Figure I). The mean age of the study population was 26.9, (CI 95% = 25.9, 27.9) and the range was from one to 100 years. The male mean age was 27.4 years while female mean age was 25.7 years (p = 0.17). The mean age of inpatients from different hospitals was as follows: government hospitals (MMC and MOI), 26.4 years (CI 95% = 25.3, 27.4), private hospitals (MMH and Agakhan), 29.4 (CI 95% = 26.7, 32.1). The difference between the two groups was statistically significant (p = . 038).

There were more males than females across all age groups. The male to female ratio in the sample was 2.3 to 1.

Figure I: Injury cases by age and sex (percentages).

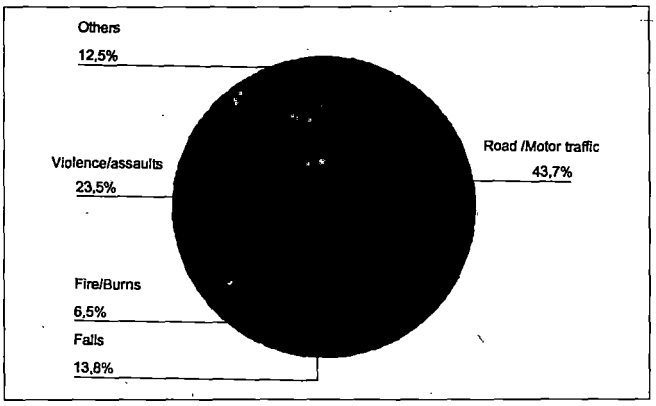


Fractures constituted the majority of the injured inpatients (35.7%) (Table II). This was followed by lacerations and cut wounds (18.5%). This most likely reflects the three most frequent mechanisms of injuries: traffic accidents (43.7%), assaults (23.5%) and falls (13.8%) (Figure II).

Table II: Recorded nature of injuries (all hospitals combined).

Nature of injury/principal diagnosis	N	%
Fracture (all types)	391	35.6
Lacerations, cut wounds	203	18.5
Abrasions, bruise, soft tissue damage	164	14.9
Eye injuries, foreign bodies	88	8.0
Concussions	80	7.3
Burns, scalds (all degrees)	57	5.2
Multiple injuries	50	4.6
Sprains, dislocations	48	4.4
Others e.g. visceral/internal injuries	14	1.3
Missing	3	0.3
Total	**1 098**	**100.0**

Figure II: Mechanism of injury.



Nature of Injury by Age and Gender.

Among patients younger than 10 years, fractures are followed by burns and foreign bodies, which account for 24.2% of all injuries in that age category. Lacerations, cut wounds and abrasions appear to be second and third cause of injury related admission across ages 10 to 50.

Table III: Nature of injury by age and sex.

Nature of injury (Male)	AGE CATEGORIES <10 n=112	11-20 n=139	21-30 n=215	31-40 n=139	41-50 n=80	>50 49.0	Total (All ages) %	n
Fracture (all types)	31.3	36.0	35.3	37.4	23.8	51.0	35.0	257
Lacerations, cut wounds	9.8	21.6	24.2	18.7	21.3	10.2	19.2	141
Abrasions, bruise, soft tissue damage	11.6	12.9	13.5	15.1	25.0	18.4	15.0	110
Concussions	8.9	9.4	8.8	7.9	8.8	2.0	8.3	61
Foreign bodies	18.8	7.9	3.3	4.3	8.8	6.1	7.5	55
Multiple injuries	4.5	4.3	4.2	5.8	8.8	8.2	5.3	39
Sprains, dislocations	2.7	5.0	6.0	7.2	1.3	2.0	4.8	35
Burns, scalds (all degrees)	12.5	0.7	2.3	2.9	1.3	2.0	3.5	26
Others e.g. visceral/internal injuries	—	2.2	2.3	0.7	1.3	—	1.4	10
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.00**	**734**

Nature of injury (Female)	AGE CATEGORIES <10 n=83	11-12 n=57	21-30 n=83	31-40 n=41	41-50 n=24	>50 n=31	Total (All ages) %	n
Fracture (all types)	41.0	31.6	38.6	26.8	41.7	—	38.2	122
Lacerations, cut wounds	8.4	21.1	15.7	29.3	20.8	—	16.6	53
Abrasions, bruises, soft tissue damage	—	24.6	19.3	22.0	8.3	9.7	15.4	49
Foreign bodies	22.9	3.5	6.0	2.4	8.3	—	9.4	30
Burns, scalds (all degrees)	12.0	7.0	10.8	9.8	4.2	—	8.8	28
Concussions	3.6	7.0	3.6	4.9	4.2	—	5.0	16
Sprains, dislocations	—	1.8	1.2	4.9	4.2	3.2	3.1	10
Multiple injuries	1.2	3.5	3.6	—	8.3	—	2.8	9
Others e.g. visceral/internal injuries	—	—	1.2	—	—	3.2	0.6	2
Total (%)	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**319**

The top three principal diagnoses (see Table IV) across all age groups and both sexes were fractures (with 35% and 38.2 % respectively for males and females), lacerations and cut wounds (19.2% and 16.6% respectively), and abrasions (15% and15.4%). Foreign bodies were more predominant among those under 10 years (22.9% females and 18.8% males) (Table III). It is also interesting to note that burn injuries (across all ages) formed a larger proportion in females i.e. 52.6% (CI 95% 34.3, 71.7%) than among males 47.4 % (CI 95% = 28.7 68.1%). (x^2= 14.8, p<0.05).

Table IV: Average number of days spent in hospital by nature of injury.

Nature of Injury/principal diagnosis	N	Mean	95% Confidence Interval for mean Lower Bound	Upper Bound
Burns, scalds(all degrees)	45	14.3	8.2	20.5
Multiple injuries	40	13.5	7.8	19.2
Fracture (all types)	363	10.8	8.6	13.0
Abrasions, bruises, soft tissue damage	149	10.3	6.3	14.4
Lacerations, cut wounds	190	8.8	5.9	11.8
Sprains, dislocations	45	8.2	4.4	11.9
Concussions	71	7.1	5.1	9.1
Others e.g. visceral/internal injuries	9	5.9	3.0	8.8
Eye injuries, foreign bodies	79	5.2	4.1	6.3
Total/all injuries	**991**	**9.7**	**8.5**	**11.0**

Length of Hospital Stay.

The overall mean duration of hospital stay for injuries in all hospitals combined was 9.7 days (CI 95%= 8.5,11). The range was one to 244 days. There was, however, a variation in the mean length of stay across different causes of injury and the hospital attended (Table IV). The duration was shorter for private hospitals such as Agakhan 6.3 days (CI 95%=5.7,7.6 days) than for government hospitals such as MOI: 11.7 days (CI 95%=9.7, 13). The differences were statistically significant (p<0.05). When stratified by the nature of injury, the length of stay appears to be statistically different only among patients with burns (p =. 013). Forty percent (CI 95% =23.9, 57.9) of patients admitted for burns at Muhimbili (n=35) stayed in hospital for less than two weeks (<15 days), while 42.9% (CI 95%=26.3, 60.6) were hospitalized for more than a month (> 28 days). Patients admitted due to burns at private hospitals (n=22), 77.3% (CI 95%= 54.6, 92.2) stayed for less than two weeks, and only 9.1 % (CI 95%= 1.1, 29.2) were hospitalized for more than a month (> 28 days).

Alcohol.

Only 29 patients (2.6%) reportedly smelt of alcohol at the time of admission.

Discussion

This study highlights the need to improve injury surveillance systems in developing countries like Tanzania. An injury

prevention programme has to be well planned and targeted, based on studies of local injury patterns. Despite the fact that not all injured patients do attend and get treated at hospitals, monitoring injuries attended to at hospitals can provide a crude measure of costs incurred due to injuries and how well preventive efforts are doing especially at reducing serious injuries which requires hospital admission.

This study also provides some indications regarding the distribution of injuries across categories and subgroups. The findings of this study are not very different from studies done elsewhere in developing countries.[3,20-22] It is shown that injuries are particularly common among young people and mainly among males. The gender ratio also is consistent with the world figure which estimates that in 1998 there was a male to female ratio of 2:1 regarding deaths from injury related causes.[23]

Some aspects of the economic implications of hospital stay can be quantified in terms of the number of days spent in hospital. The mean duration for all causes was nine days, but with a marked variation across categories of injuries. It is important to note that although the proportion of burn injuries was less than other types of injuries, they spent more time in hospitals. The observed statistically significant difference among private and government hospitals among burn patients, may signify one of two things: first, patients with more severe burns requiring extended hospitalizations are seen at Muhimbili; or they are initially attended to at the private hospitals but later transferred to government hospitals due to rapidly accumulating costs in private hospitals. Depending on the degree, the process of burn healing and treatment that may include skin grafting is a slow process. In Zimbabwe one study revealed that the mean stay in hospital for burns patients was 15 days.[24] As expected, patients with multiple injuries and fractures also spend more time in hospitals with means of 13.5 and 10.7 days respectively.

As far as missing observations are concerned, there was a similar pattern among all four hospitals. The following variables were routinely recorded: age, the principal diagnosis (nature of injury), the body part injured and the gender of the injured. These variables are important for acute care of the patient but offer little information as far as health promotion and prevention is concerned. Almost none of the hospitals routinely record the circumstance/ activity surrounding the injury, marital status, intent, the mechanism of injury and place of occurrence. The severity of injuries as described by AIS (Abbreviated Injury Scale) was not recorded at all in these hospitals. With overcrowded hospitals and lack of enough physicians, it is not surprising to note that some records do miss important injury related variables. The problem of missing variables in medical records has been documented elsewhere in both developed and developing countries .[4,25,26]

Although only 2.6% of patients reportedly were intoxicated with alcohol at the time of admission, we suspect that this may be an underestimation of the role of alcohol in injury causation partly because blood alcohol concentration (BAC) is not routinely measured in the emergency rooms. Several studies elsewhere though, have shown that different types of injuries have been associated with alcohol intoxication.[27-29] There is a need therefore, for further prospectively designed studies to explore the role of alcohol in injury.

There are few published studies in Tanzania regarding causes of injury related hospital admissions. Most previous studies have focused on road traffic accidents and have been done in one hospital.[21,22,30,31] The range of information covered in these studies has been rather narrow.

This present study has some methodological limitations. Regarding the general nature of our findings, ideally, the study should have been based on a sample randomly drawn from all injury related inpatient records at all hospitals in the Dar es Salaam region. Due to the high number and geographical locations of these hospitals, such a procedure would be far too costly and time consuming. Instead, we chose to sample from four hospitals: two government and two private. In Dar es Salaam, there are five government hospitals [17] two of which are included in this study. The systematic selection of cases from a chronologically arranged system of records ensures fair representation of patients' records from the government hospitals. For private hospitals and government hospitals, the validity of our findings rests on the assumption that the hospitals selected are not systematically different from other hospitals in Dar es Salaam city. There are, however, no data available to check this assumption.

Secondly, this study utilized the medical records. Such use of medical records for injury research purposes is not unusual,[8,10,30,31] and is described as an unobtrusive method for data collection. Medical records have been characterized by some authors as a readily available and accessible source of rich data at little cost.[32,33] Moreover, such a method is not subject to recall bias. Despite its limitations, this kind of design can often (with thorough exploration) suggest new research questions or act as a starting point for unforeseen lines of enquiry.

Conclusions and Recommendations.

This study has shown that there is need for considerable improvement in the way injuries are registered in hospitals. Such registration can be one of the most useful tools for research on injury prevention and for evaluating ongoing interventions. In the absence of a reliable hospital based injury registry, we will have to continue relying on police records and the media. Police records not only focus narrowly on road traffic accidents, but have also been reported to under report injuries compared to hospitals.[34]

Improving injury surveillance systems can either be done by utilizing the existing infrastructure or by establishing a separate registration system. Of particular importance is the recording of the exact circumstances of the injury event (activity, place of occurrence and the role of alcohol etc.) as well as other social demographic variables such as marital status and employment status. It should, however, be noted that the cost of data collection remains high, unless it can be built into routines in the emergency departments of the hospitals.

Much attention is always given to road traffic accidents, but home accidents are also a problem posing a considerable burden. For example in this study, burn injuries, which occur mostly at home, were found to be a major problem among children below 10 years old and among women.

Despite the limitations stated, these data describe some aspects of the most likely composition of hospitalized patients in terms of age, gender, type of injury and the mean length of days spent in hospitals. However, to design an effective intervention programme, further research which elucidates the role of host-environment-agent interactions in injury causality is needed.

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